# 2021 Wyoming Forest Health Highlights

# Contents

2021 Wyoming Forest Health Damage Graph by Agent ..... 1
2021 Acres Damaged and 2019 Comparisions ..... 2
Map of 2021 Forest Health Damage ..... 3
Map of 2021 Forest Health Damage by Agent ..... 4
Western Spruce Budworm ..... 5
Spruce Beetle ..... 6
Douglas-fir Beetle ..... 7
Pine Engraver ..... 8
Western Pine Tussock Moth ..... 9
Japanese Beetle ..... 10
Other Bark Beetles ..... 11
    Mountain Pine Beetle ..... 11
    Western Balsam Bark Beetle ..... 11
    Twig Beetles ..... 11
Drought ..... 12
Invasive Insects ..... 13
    Emerald Ash Borer ..... 13
    Thousand Cankers Disease ..... 13
    Balsam Woolly Adelgid ..... 13
    Spongy Moth ..... 13
Other Forest Health Damage Agents Recorded in 2021 ..... 14
    Root Rots ..... 14
    Foliage Diseases ..... 14
    Other Forest Pathogens ..... 14
For More Information Contact ..... 15

# 2021 Wyoming Forest Health Damage Graph by Agent

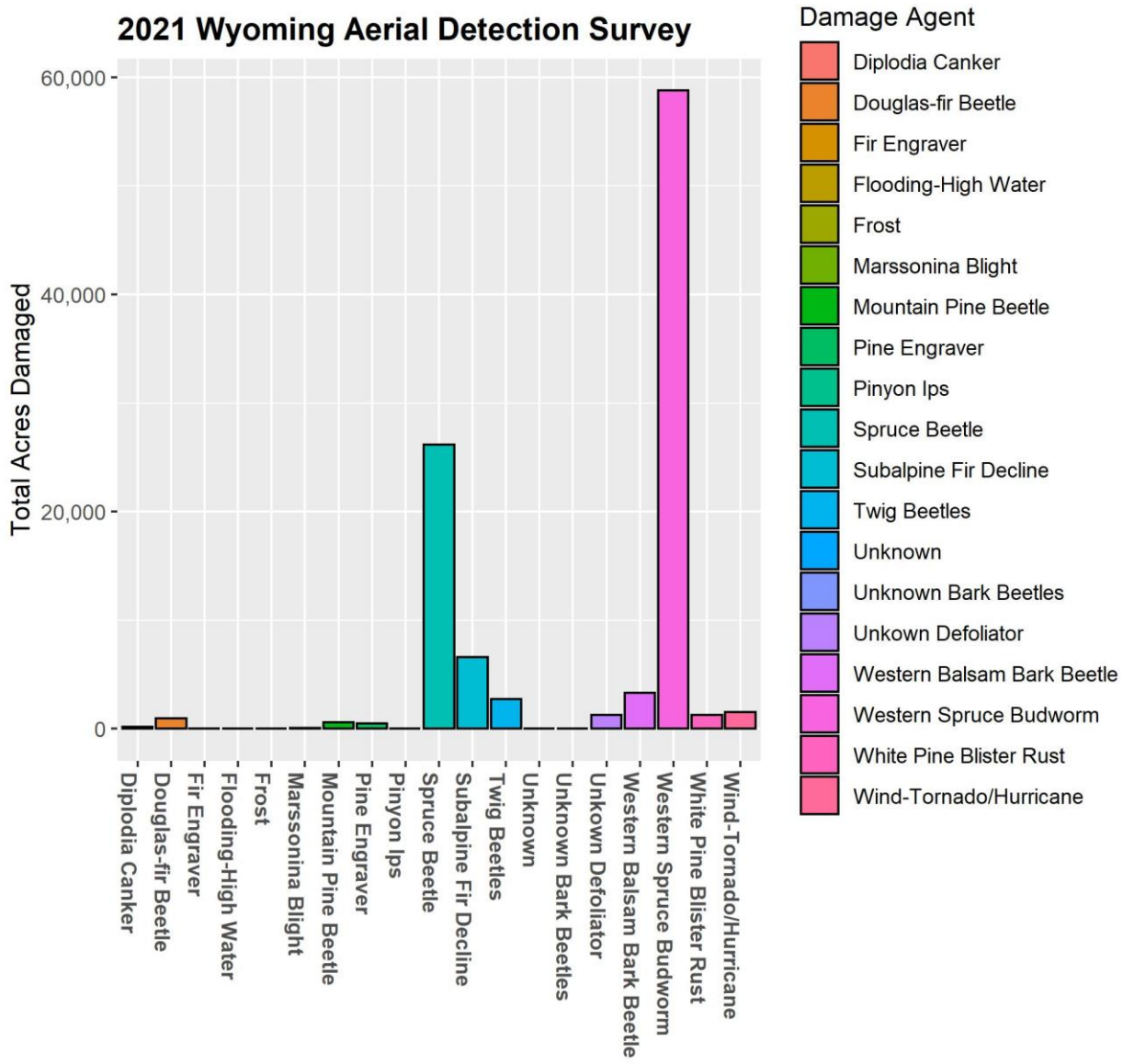


*Figure 1 shows the total acres impacted by forest health dam*age agents across Wyoming collected through the aerial survey program in 2021*. Forest health data is collected using aerial survey and ground based methods by the Wyoming State Forestry Division and United States Forest Service. 740 acres were recorded by aerial survey as balsam woolly adelgid (BWA) on the western side of the state. Due to BWA not being confirmed in Wyoming, the 740 acres were added to Subalpine Fir Decline. The same was done for the table in Figure 2.*

## 2021 Acres Damaged and 2019 Comparisions

| Damage Agent | 2021 Acres Recorded | Change Since 2019 |
|---|---|---|
| Diplodia Canker | 154 | -218 |
| Douglas-fir Beetle | 963 | 860 |
| Fir Engraver | 7 | NA |
| Flooding-High Water | 3 | -369 |
| Frost | 8 | NA |
| Marssonina Blight | 59 | -2015 |
| Mountain Pine Beetle | 591 | -416 |
| Pine Engraver | 496 | 414 |
| Pinyon Ips | 2 | NA |
| Spruce Beetle | 26194 | 3394 |
| Subalpine Fir Decline | 6624 | -621 |
| Twig Beetles | 2719 | NA |
| Unknown | 10 | -1592 |
| Unknown Bark Beetles | 8 | NA |
| Unkown Defoliator | 1293 | -767 |
| Western Balsam Bark Beetle | 3302 | -2427 |
| Western Spruce Budworm | 58771 | -107154 |
| White Pine Blister Rust | 1264 | 173 |
| Wind-Tornado/Hurricane | 1552 | -83 |

*Figure 2. The above table displays total acres impacted by damage agent. It also compares the acres damaged by agent to their totals in 2019. Green indicates fewer acres damaged while red indicates more acres damaged. NA shows damage agents that were present in 2021 but not in 2019. 2019 is used for comparison purposes due to incomplete survey coverage in 2020. Balsam woolly adelgid acres were combined with Subalpine Fir Decline acres due to it not being positively confirmed in Wyoming.*

## Map of 2021 Forest Health Damage

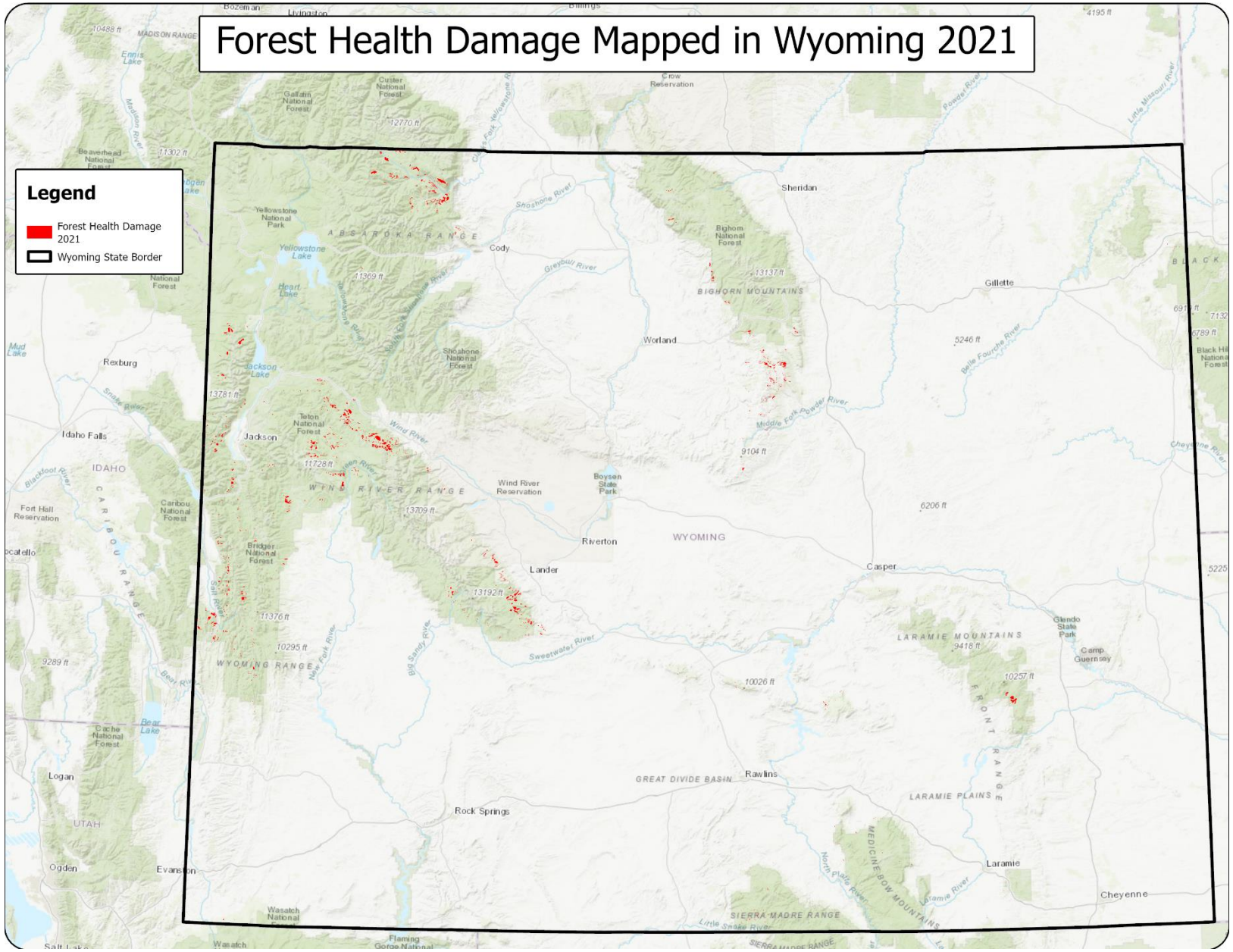


*Figure 3. The map above shows the extent and scale of forest health damage recorded in 2021 across Wyoming. At this scale some damage is not visible.*

## Map of 2021 Forest Health Damage by Agent

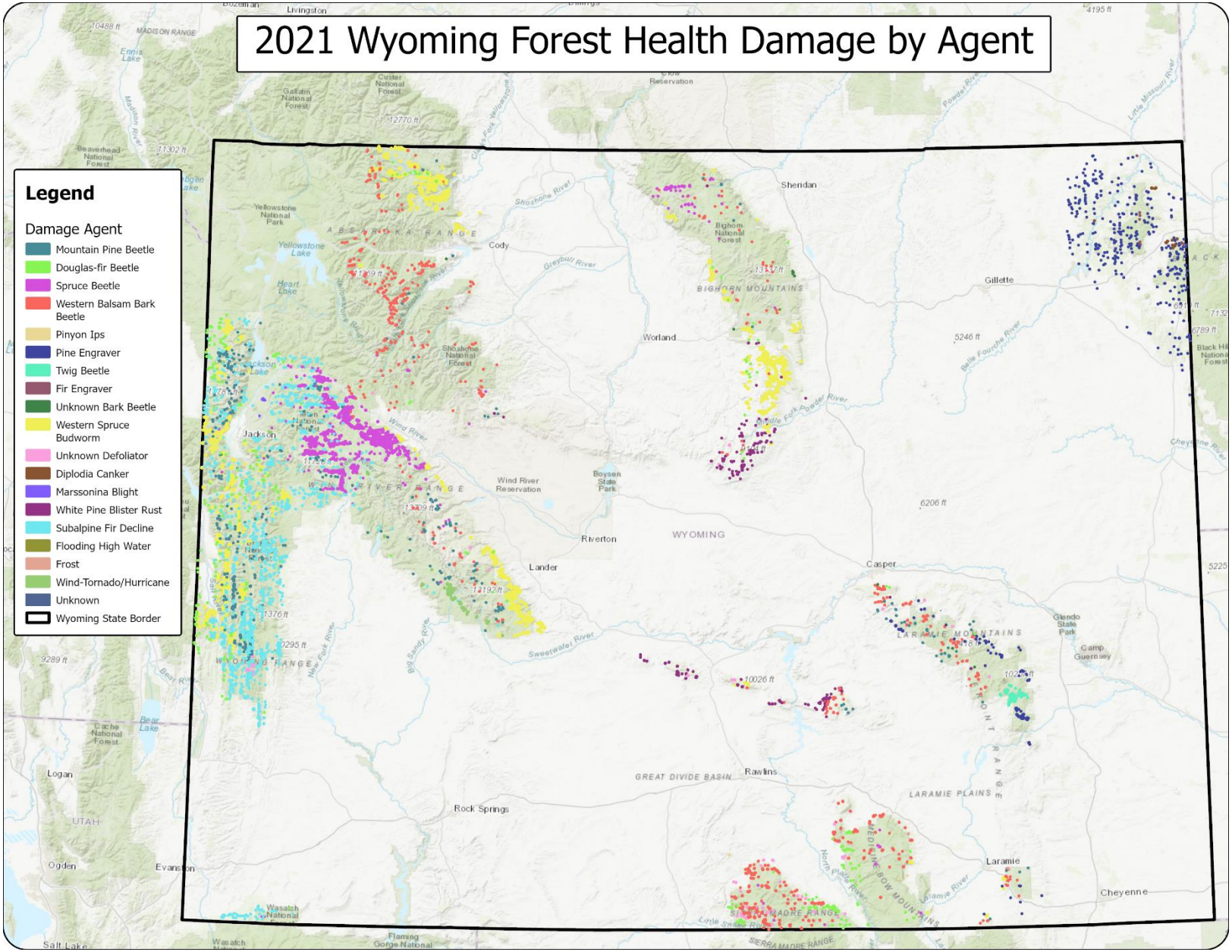


*Figure 4. The map above shows the location of all mapped forest health damage agents in 2021 across Wyoming. The colored points have all been increased in size by a factor of three to increase their visibility at a statewide scale.*

## Western Spruce Budworm

*Choristoneura freemani*

Western spruce budworm (WSBW) continues to be Wyoming's most damaging forest pest by acreage. 2021 saw a significant reduction in acres impacted compared to 2019. The difference largely comes from reduced acres mapped on the Bridger-Teton National Forest. The Southern Bighorns continue to see significant defoliation with mortality of smaller suppressed trees. In addition to the Bighorns and Bridger Teton National Forest, the Shoshone National Forest has WSBW defoliation on the Northern and Southern ends of its range. WSBW acreage is often underreported on aerial survey due to detection difficulty. WSBW outbreaks can be long lasting. Severe repeated defoliation leads to mortality or increased susceptibility to other damage agents.

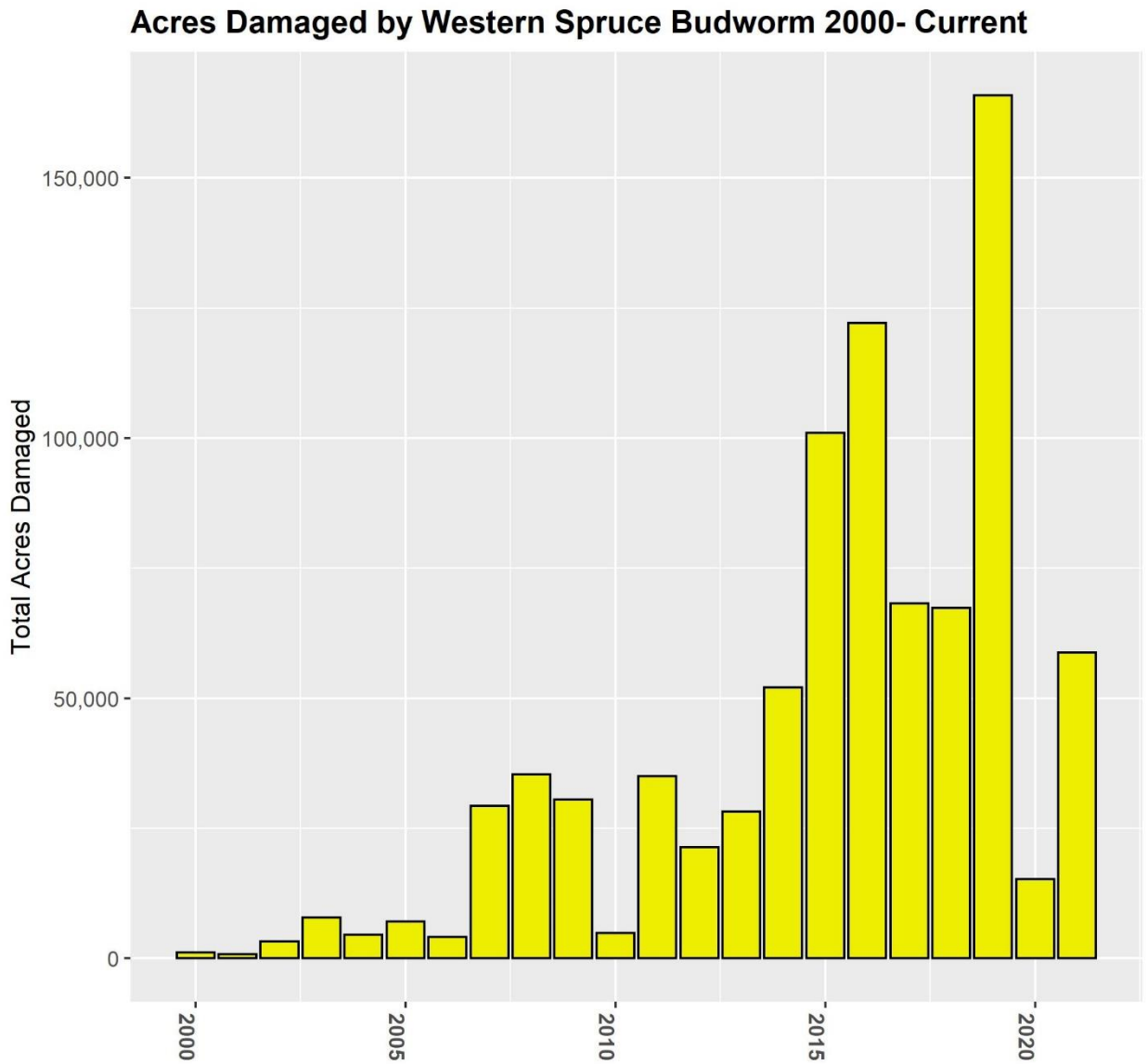


*Figure 5 shows total acres by year of recorded damage by western spruce budworm. Survey coverage was reduced in 2020 and shouldn't be used for comparison purposes to other years.*

## Spruce Beetle

*Dendroctonus rufipennis*

Spruce beetle damage continues to be ongoing with similar levels of mortality being observed since 2016. Previous pockets of mortality around the central portion of the Shoshone National Forest and central eastern portion of the Teton National Forest (Figure 4) are slowly expanding and being filled in. Over the past couple of years, aerial surveys have seen individual trees and small areas of spruce beetle activity in the Bighorn National Forest. Mortality in the Bighorns from spruce beetle hasn't become widespread, but USFS and WSFD are monitoring the situation.

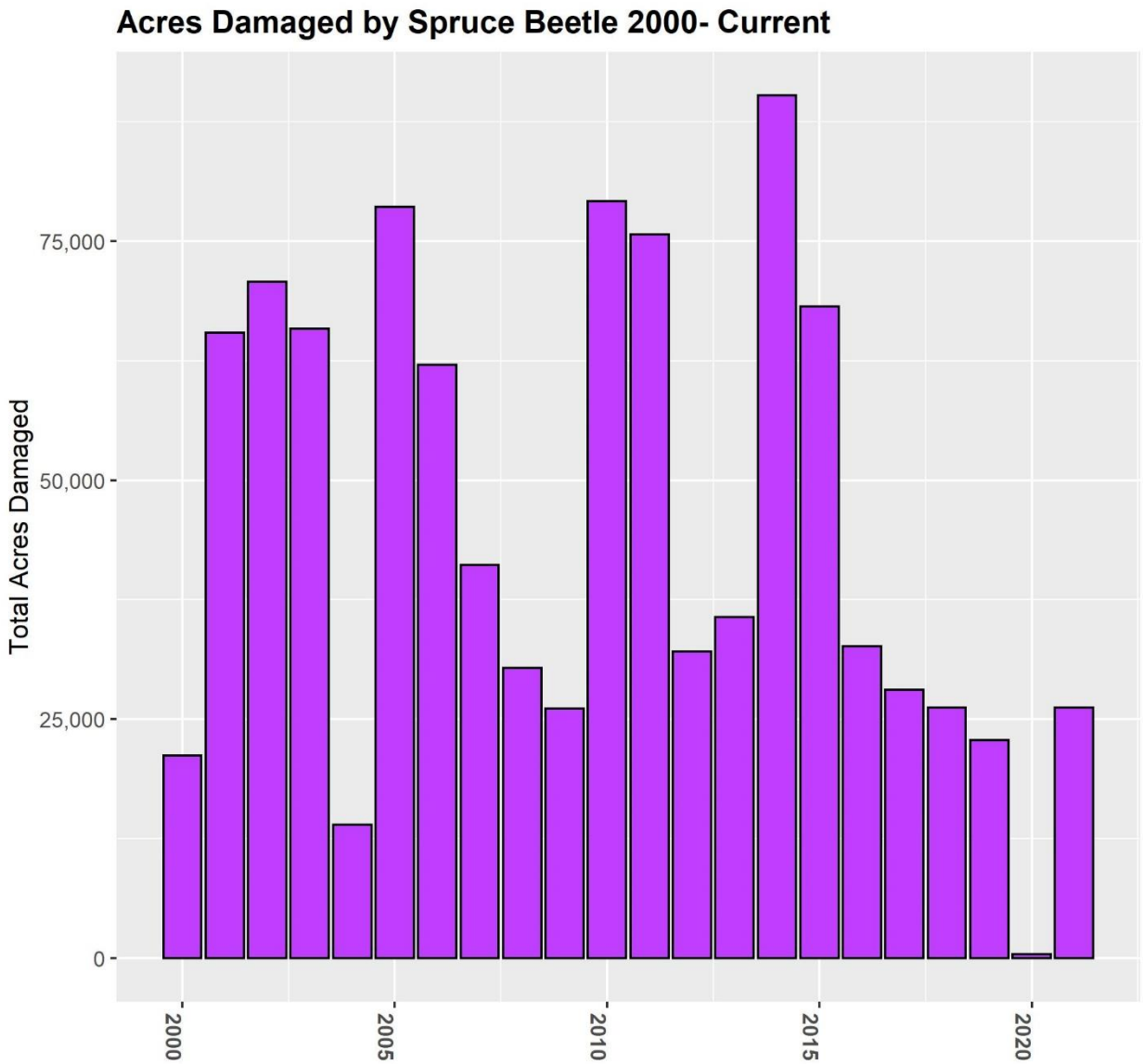


*Figure 6. The graph above shows total acres by year of recorded damage by spruce beetle. Survey coverage was reduced in 2020 and shouldn't be used for comparison purposes to other years.*

## Douglas-fir Beetle

*Dendroctonus pseudotsugae*

A small increase in acres of Douglas-fir beetle killed trees were recorded in 2021 compared to 2019. Douglas-fir beetle populations generally remain at low levels only attacking weakened or dead trees. Pockets of new mortality mapped throughout the Medicine Bow National Forest are largely the result of trees severely weakened by the Mullen fire in 2020. Severe western spruce budworm defoliation and drought has been linked to Douglas-fir beetle outbreaks historically, resulting in tree mortality across the landscape. Many areas across Wyoming such as the Southern Bighorns are at risk for Douglas-fir beetle attacks.

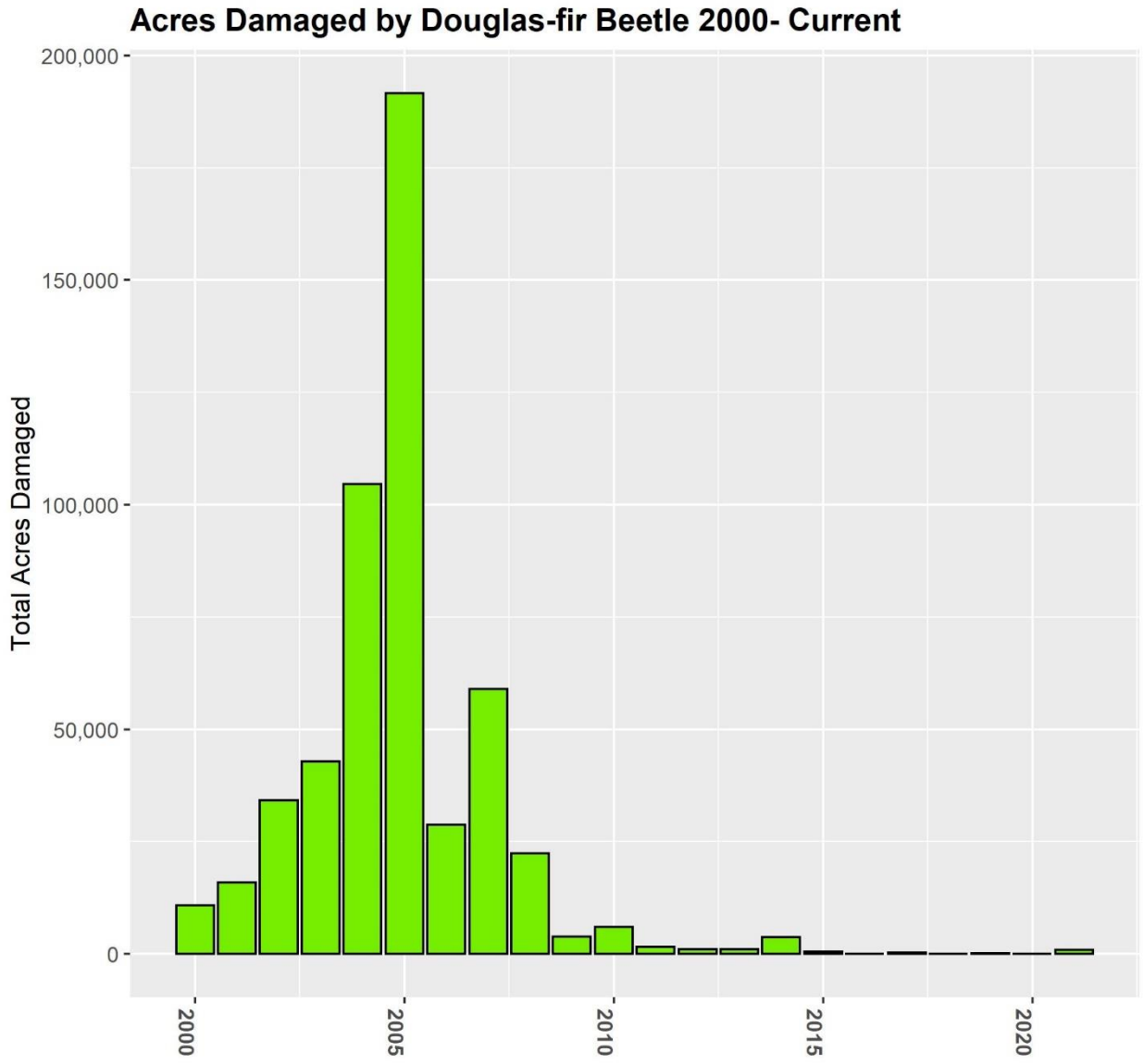


*Figure 7 shows total acres by year of recorded damage by Douglas-fir beetle. Survey coverage was reduced in 2020 and shouldn't be used for comparison purposes to other years.*

## Pine Engraver

*Ips pini*

Pine engraver and other *Ips* species are the main bark beetles causing tree mortality and top kill in ponderosa pine. The Black Hills region continues to see high levels of *Ips* activity as the mountain pine beetle epidemic has subsided. *Ips* species can have multiple generations during a season, which allows them to quickly respond to favorable environmental conditions. Shorter winters followed by longer hotter drier summers stress trees and increase the likelihood of *Ips* caused tree mortality.

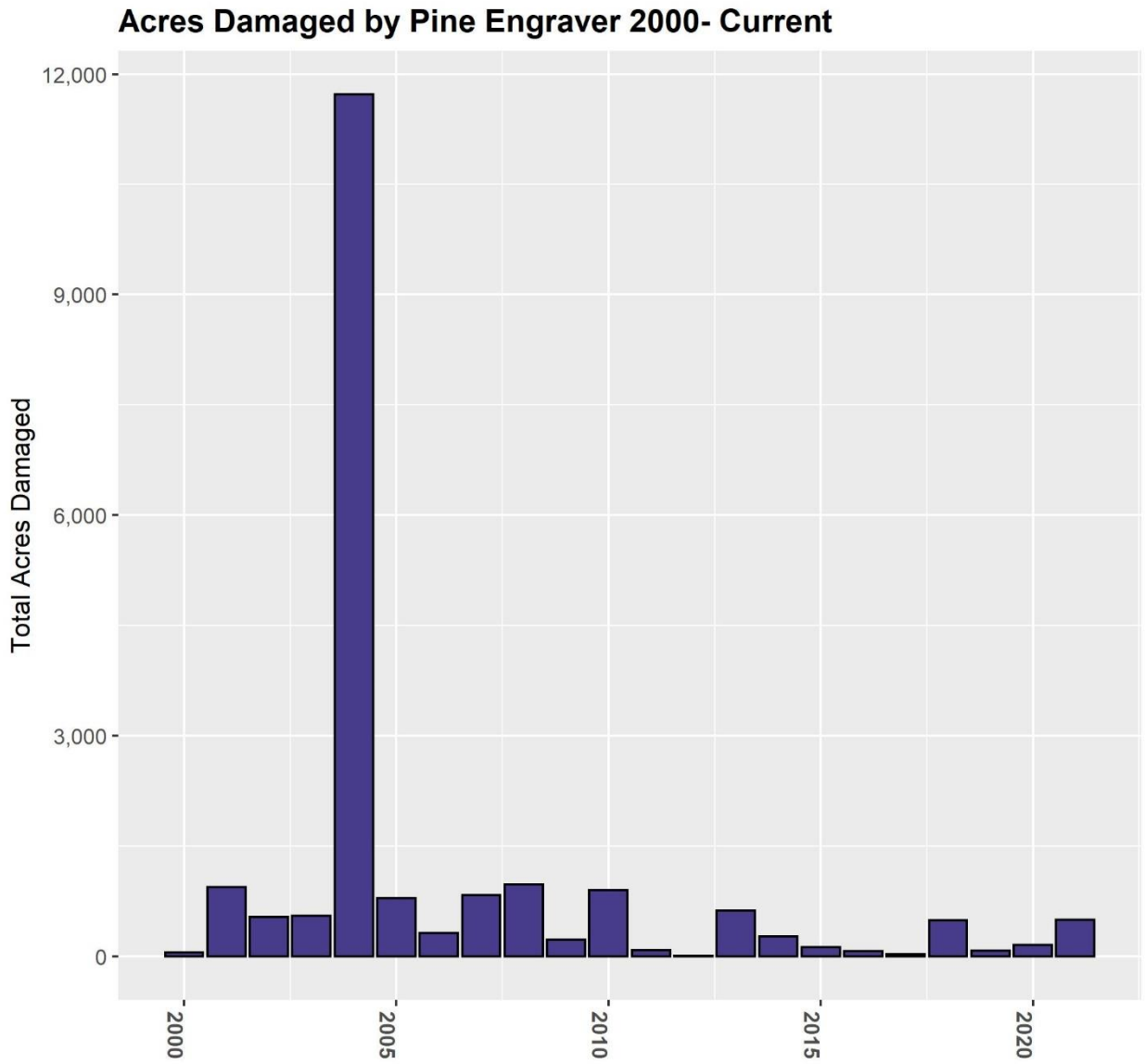


*Figure 8. The graph above shows total acres by year of recorded damage by pine engraver. Survey coverage was reduced in 2020 and shouldn't be used for comparison purposes to other years. Prior year data mapped in ponderosa pine labeled Ips Engraver Beetles has been included in the above graph. Pine Engraver is the predominant Ips species found attacking ponderosa pine.*

## Western Pine Tussock Moth

*Dasychira grisefacta*

A western pine tussock moth outbreak was found in the NE corner of the state where the Crook and Campbell County lines meet the Montana border. An estimated 150 acres of ponderosa pine were completely defoliated. Evidence of larvae and pupal cases were found around the perimeter in less impacted trees. Western pine tussock moth outbreaks are historically rare in Wyoming.

*Figure 9 shows a late instar western pine tussock moth larvae.*

*Figure 10. A dense stand of ponderosa pine with almost complete defoliation at the heart of the western pine tussock moth outbreak.*

## Japanese Beetle

*Popillia japonica*

Japanese Beetle (JB) was first confirmed in Wyoming in 2020. At the end of last year it was unknown if JB would survive the winter and establish a population. 2021 saw a return and an increase of JB in Sheridan. All detection and monitoring traps located in Sheridan (Figure 12) caught JB in 2021. Figure 11 shows the total JB caught in traps by date over the flight period. JB is an invasive insect that is destructive to turf and a variety of broadleaf tree species. The city of Sheridan is the only known area within the state with JB. Two additional JB traps were placed at the Casper and Cheyenne airports that came back negative.

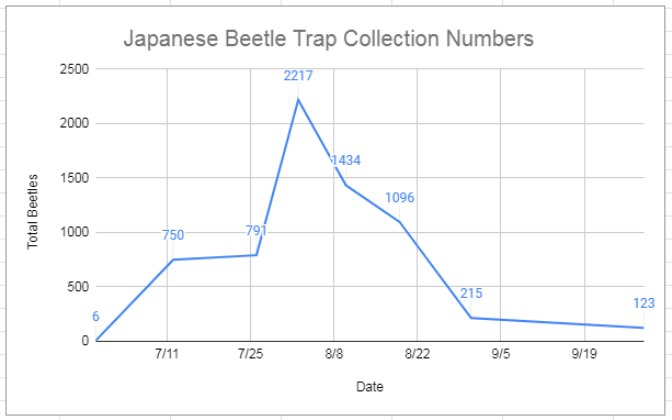


*Figure 11. Total Japanese beetles caught in traps displayed in Figure 12 by date throughout the city of Sheridan. Graph is courtesy of Clark Van Hoosier, City of Sheridan Arborist.*

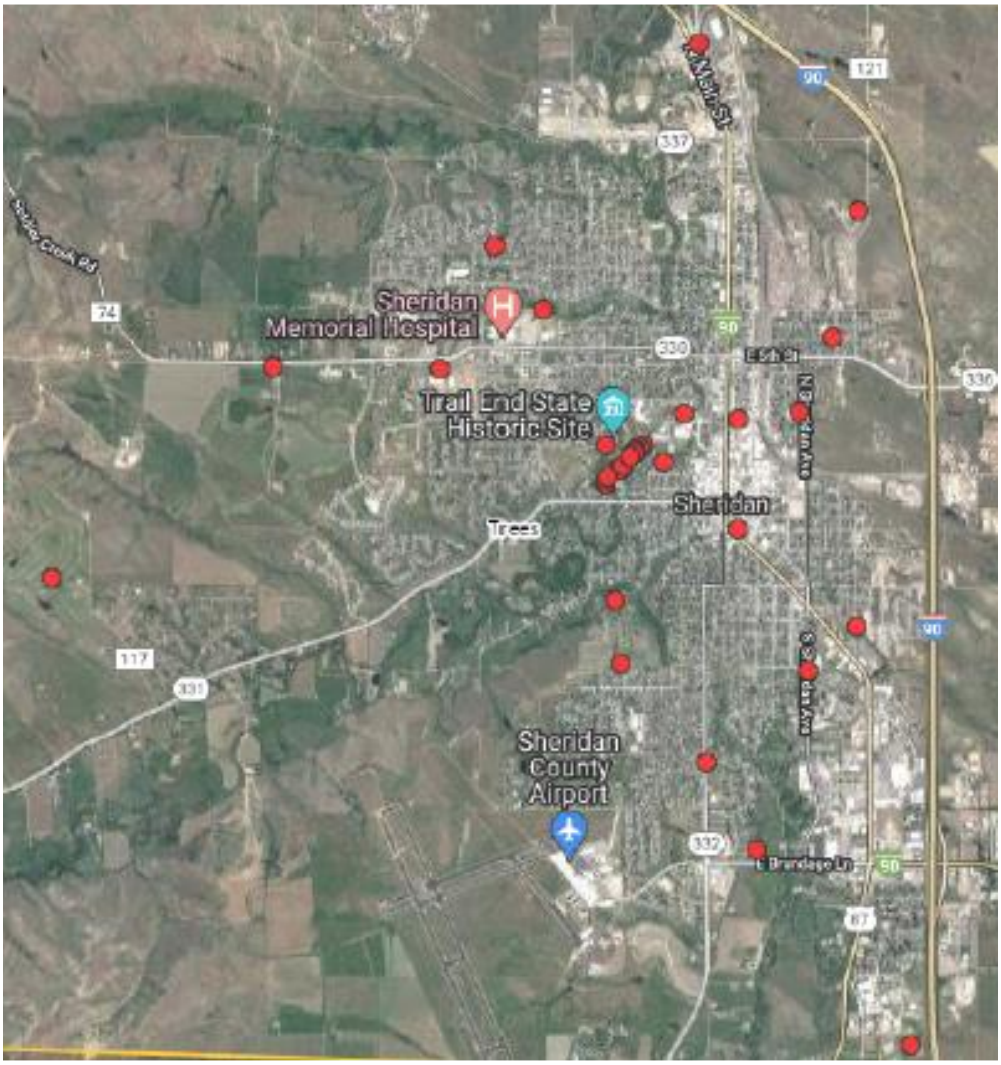


*Figure 12 shows Japanese beetle monitoring traps placed around the city of Sheridan. Each trap was positive for JB by the end of the flight period. Map is courtesy of Clark Van Hoosier, City of Sheridan Arborist.*

# Other Bark Beetles

## Mountain Pine Beetle

*Dendroctonus ponderosae*

Mountain pine beetle (MPB) continues to remain at low populations. Low numbers of mapped mortality are normal with only weakened or highly stressed trees generally being killed. Many recorded MPB killed trees were limber and high elevation white bark pine, severely weakened by white pine blister rust.

## Western Balsam Bark Beetle

*Dryocoetes confusus*

Western Balsam Bark Beetle (WBBB) mortality is found throughout the state impacting individual and small clusters of trees in subalpine fir forests. Figure 4 indicates high amounts of marked WBBB mortality, however the acreage in comparison to other damage agents is relatively low (Figure 1). This is due to WBBB mortality commonly being marked as individual instances and not continuous large areas. WBBB is not considered a major forest pest and doesn't cause widespread mortality compared to mountain pine beetle, spruce beetle or Douglas-fir beetle.

*Figure 13. Western balsam bark beetle killed trees seen on Casper Mountain.*

## Twig Beetles

*Pityophthorus spp., Pityogenes spp.*

Twig beetles refers to a multiple different species of small bark beetles that affect the branches of trees. In Wyoming, issues with twig beetles are found in the SE corner of the state effecting ponderosa pine. Areas include Curt Gowdy State Park, around Guernsey and south of the Laramie Mountains. Impacts from drought/twig beetles has been observed since 2018, but 2021 is the first year it was recorded as part of the aerial survey.

*Figure 14. Combination of drought and twig beetle stressed pines located in Albany County.*

## Drought

Drought is an important abiotic factor impacting the resistance and resilience of trees to forest health damage agents. When trees lack adequate moisture, they are unable to produce defensive compounds or withstand reductions in vigor by insects and disease. Many forest health pest outbreaks are tied to drought stress in forests.

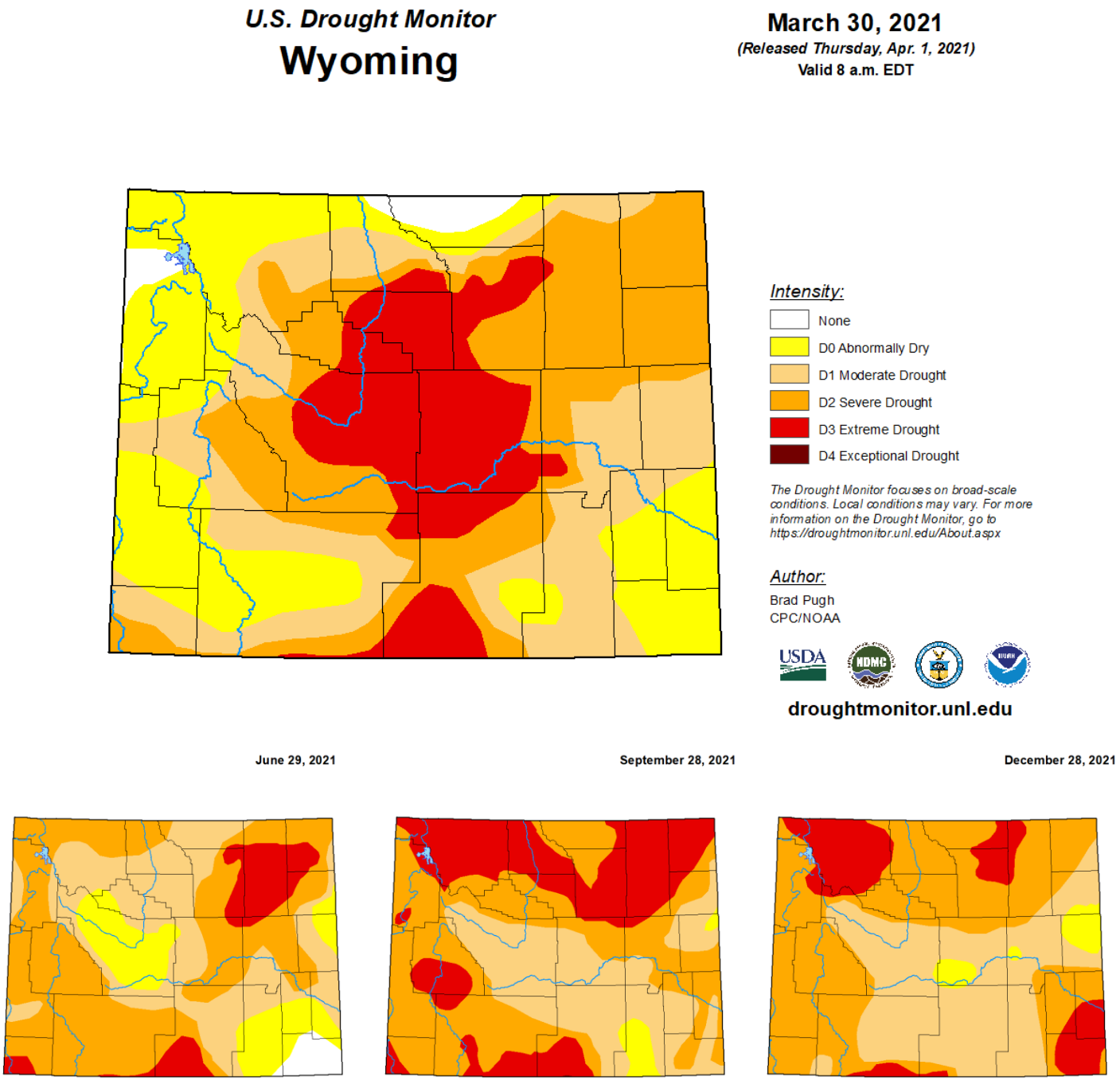


*Figure 7. Drought maps for Wyoming at approximate quarter intervals throughout the 2021 year. Each map provides an estimated amount of drought for that day.* Level of drought stress fluctuates throughout the year by area.

# Invasive Insects

## Emerald Ash Borer

*Agrilus planipennis*

Wyoming State Forestry continues to coordinate and carry out trapping for emerald ash borer (EAB) throughout the state. In 2021, 65 traps were placed in 20 communities. No EAB was found. Traps are placed in high risk communities and areas. Areas are considered high risk if they have any of the following: urban ash trees, are along major transportation routes, or in high use tourist areas. EAB has not been positively detected in Wyoming.

*Figure 16. Emerald ash borer trap hung in a campground in Buffalo, WY.*

## Thousand Cankers Disease

The first confirmation of Thousand Cankers Disease (TCD) in Wyoming was found in 2021. Two trees were identified as having TCD. Both are black walnuts (*Juglans nigra*) located in Cheyenne at separate sites. TCD is considered an "insect-disease complex" consisting of three factors: 1) walnut twig beetle (Pityophthorus juglandis), a native beetle that feeds on the inner bark, 2) fungal spores, (Geosmithia morbida), carried on wings of the beetle and deposited around galleries, and 3) subsequent canker formation around galleries. TCD originated in the western United States and is not native to Wyoming.

## Balsam Woolly Adelgid

*Adelges piceae*

Surveys were done for the invasive insect balsam woolly adelgid in western Wyoming and no specimens were confirmed. Many areas of subalpine fir appear to be declining without definitive cause. Balsam wooly adelgid primarily affects subalpine fir, grand fir and white fir. It is currently found in areas of Utah, Idaho and Montana along the western border of the state.

## Spongy Moth

*Lymantria dispar*

As part of the national USDA spongy moth program, WSFD installed, monitored and evaluated 98 detection traps across 6 counties. 3 positive identifications were made, two in Park County and one in Crook County. In 2022, delimiting traps will be done at positive location sties to determine infestation status and extent.

*Figure 17. Spongy moth detection trap hung in Cheyenne, WY.*

# Other Forest Health Damage Agents Recorded in 2021

## Root Rots

Root rots are long lasting destructive pathogens found in forested settings. They may contribute to insect outbreaks by providing influxes of suitable breeding material or make sites hazardous to falling trees. At areas heavily affected by root rot, it is common to find more than one species causing damage. Root rot pathogens persist in the soil and are spread by root to root contact of trees.

- Armillaria Root Disease (*Armillaira spp.*)
  Affects Douglas-fir, true firs, pines, aspen, and spruce. Part of the damage agent complex resulting in subalpine fir decline.

- Heterobasidion Root Disease S-type (*Heterobasidion occidentale*)
  Found in western Wyoming affecting spruce, Douglas-fir and true fir species.

- Tomentosus Root Rot/False Velvet Top Fungus (*Onnia tomentosa*)
  Primarily found in spruce forests throughout western Wyoming.

## Foliage Diseases

- Marssonina Blight (*Drepanopeziza spp.*)
  Common leaf disease in aspen resulting in premature defoliation. Found throughout Wyoming.

- Rhabdocline Needle Cast (*Rhabdocline spp.*)
  Causes drop of older needles in Douglas-fir. Rarely results in mortality. Recorded in Lincoln County in 2021.

## Other Forest Pathogens

- Dwarf Mistletoe (*Arceuthobium spp.*)
  Most common conifer foliar pathogen within the western part of Wyoming and throughout the intermountain west. Primarily affects pine species and Douglas-fir. Native parasitic plant causing branch die back, top kill and occasionally mortality.

- Cytospora Canker of Fir (*Cytospora abietis.*)
  Contributes to subalpine fir decline. Commonly associated with stressed trees. Other cytospora species can be found throughout Wyoming affecting spruce and aspen species.

- White Pine Blister Rust (*Cronartium ribicola*)
  Nonnative invasive pathogen resulting in mortality in limber and high elevation white bark pine stands throughout Wyoming.

# For More Information Contact

Wyoming State Forestry Division

Harrison Brookes

Forest Health Program Manager

307-777-5495; harrison.brookes@wyo.gov